

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 09-033882

(43)Date of publication of application : 07.02.1997

(51)Int.Cl.

G02F 1/133  
F21V 8/00  
G02B 6/00  
G02F 1/1335  
G02F 1/1335

(21)Application number : 07-178426

(71)Applicant : HITACHI LTD  
HITACHI DEVICE ENG CO LTD

(22)Date of filing : 14.07.1995

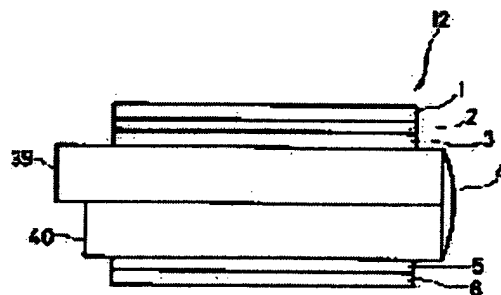
(72)Inventor : NAKAMURA YOSHIKI

## (54) LIQUID CRYSTAL DISPLAY DEVICE

(57)Abstract:

**PROBLEM TO BE SOLVED:** To improve visual angle characteristics in all up and down, and right and left directions of the screen of a liquid crystal display element.

**SOLUTION:** On the projection light side of a liquid crystal cell 4, a light scattering plate 3, a 1st negative phase difference plate 2, and a 1st polarizing plate 1 are arranged in order and on the incident light side, a 2nd negative phase difference plate 5 and a 2nd polarizing plate 6 are arranged in order; and the twist angle of liquid crystal is  $240^\circ$ ,  $\Delta n$  of the liquid crystal 865nm, the angle of the absorption axis of the 1st polarizing plate 1  $10^\circ$ , the angle of the elongation axis of the 1st phase difference plate 2  $70^\circ$ , the angle of the elongation axis of the 2nd phase difference plate 5  $110^\circ$ , the angle of the absorption axis of the 2nd polarizing plate 6  $80^\circ$ , the sum of  $\Delta n$ 's of two phase difference plates 2 870nm, and the coefficients of vertical orientation  $N_z$  of the phase difference plates 2 and 5 is 0.1-0.7. The light scattering plate 3 is so arranged that light is scattered in directions of  $\theta=90-270^\circ$  and its scattering angle is  $\phi=10-80^\circ$ . Two prism sheets of a back light has a  $90^\circ$  V-shape angle of V- sectioned grooves, the respective prism sheets are laminated and arranged having their grooves orthogonally, and a diffusion sheet and a light guide plate is arranged in order beneath the two prism sheets.



## LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of  
rejection]

[Date of requesting appeal against examiner's decision  
rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office